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ABSTRACT

Five-to-10-year-old children identified familiar melodies presented in three ways: intact, wandering with the same key, or wandering outside the key. Previous work with rhythmically uniform melodies had shown a regular developmental progression in the use of contour, tonality, and exact pitch intervals in melody identification. In this study, with rhythmically distinctive melodies, performance was better, and children used the rhythmic cues by 5 years. Two of the four melodies showed the developmental ordering obtained previously. (Author/KM)

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Rhythm and Tonality in Children's Recognition of Intact and Distorted Melodies

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ABSTRACT

Children 5 to 10 yr old identified familiar melodies presented intact (ST), wandering within the same key (TW), or wandering outside the key (AW). Previous work with rhythmically uniform melodies had shown a regular developmental progression in the use of contour, tonality, and exact pitch intervals in melody identification. Here, with rhythmically distinctive melodies, performance was better, and children used the rhythmic cues by 5 yr. Two of the four melodies showed the developmental ordering obtained previously.

BACKGROUND

Two issues in the development of melody recognition are:

- the importance of melodic contour vs. exact pitch intervals in test melodies (and by implication, in memory); and
- the importance of conformity to the tonal scheme defined by the culture.

The development of these aspects of melody recognition was explored in a study by Andrews & Dowling (Music Perception, 1991). There two familiar melodies ("Twinkle, Twinkle, Little Star" and "Old Macdonald") were presented in their usual "straight" version (ST), or in a version that wandered in pitch while preserving the contour (ups and downs) of the melody. The wandering versions either stayed within the tonal framework of the major scale (tonal wandering--TW) or departed from it (atonal wandering--AW). Figure 1 shows ST, TW, and AW versions of a melody from the present experiment. (Andrews & Dowling used interleaved distractor notes in the background which we did not use here.)

The listener's task was to identify the melody on each trial in spite of the distortions. The relative importance of contour and intervals was assessed via comparison of performance with tonal straight (ST) versions preserving exact pitch intervals, and tonal wandering (TW) ver-

sions preserving contour but not intervals. The importance of tonality was assessed via the comparison of tonal wandering (TW) vs. atonal wandering (AW) versions.

Andrews and Dowling found the results shown in Figure 2. At the age of 5-6 yr children performed equally well indentifying all versions of the tunes. By the ages of 7-8 tonality had become important as a feature of the melodies, and performance on ST and TW items was better than on AW. And by 9-10 performance was best on ST versions in contrast to both types of wandering version (TW and AW). This suggests a regular developmental progression from reliance on contour in melody recognition (5-6 yr), through reliance on tonality in addition to contour (7-8 yr), to reliance on exact interval sizes (9-10 yr).

METHOD

In this experiment we sought to extend the findings of Andrews and Dowling by using:

- four melodies instead of two ("Mary Had a Little Lamb"--MHLL, "London Bridge"--LB, "Here We Go 'Round the Mulberry Bush"--HWG, "Pop! Goes the Weasel"--PGW);

- natural (vs. stylized) rhythms;

- melodies rhythmically differentiated in pairs by meter: duple (MHLL, LB) vs. triple (HWG, PGW) (see Fig. 1); (We wanted to find out if children could use the rhythmic cue effectively.)

- four age ranges (adding 11-12 year-olds); (There were 122 children and 27 adults in the study.)

- melodies 14-18 notes long (about twice as long as in Andrews & Dowling). Melodies were generated by computer and presented at 3 quarter-notes/sec.

Subjects were tested in small groups in their school music classes. There were 40 trials. The younger children identified the melodies by circling pictures on an answer sheet (see illustration).

RESULTS

Overall performance (relative to chance level of .25) was much better than in Andrews & Dowling (where chance was .50). Proportions of correct responses (Figure 3) were subjected to a 6 Age/Experience Levels X 3 Conditions (ST, TW, AW) X 4 Tunes ANOVA. The main effects of age (.001), condition (.01), and tune (.01) were significant. The interactions Age X Tune (.01) and Condition X Tune (.01) were significant, and the Age X Condition X Tune interaction approached significance (.10).

It is in the latter partitioning of results that we can assess the comparison with the results of Andrews and Dowling. The two easier tunes (MHLL, HWG--Fig. 4) produced a pattern qualitatively similar to that of Figure 2. In contrast, the two harder tunes (LB, PGW--Fig. 5) produced a pattern in which performance on the AW condition was uniformly lower than the other conditions for all but the youngest children.

Children were well able to use the metrical differentiation between the two pairs of melodies by the age of 5 yr. Effective use of that cue increased with age between 5 and 10 yr in the most difficult AW condition (Fig. 6). To index the use of the rhythmic cue we took the proportion of errors that gravitated to the item with the same meter as the correct melody, beyond those expected by chance. That is, if MHLL was the correct answer, we would expect 1/3 of the errors on that trial to fall to each of the three other alternatives. The degree to which those errors selected the other duple-meter item (LB) over and above that expected represents the degree to which sujects were using the rhythmic cue.

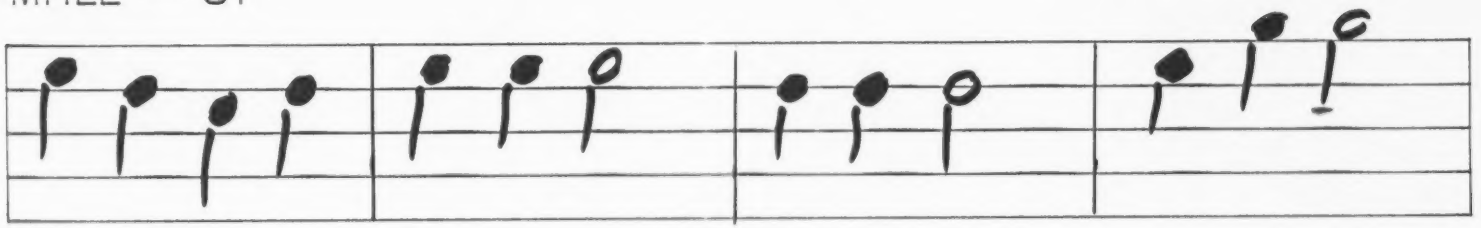
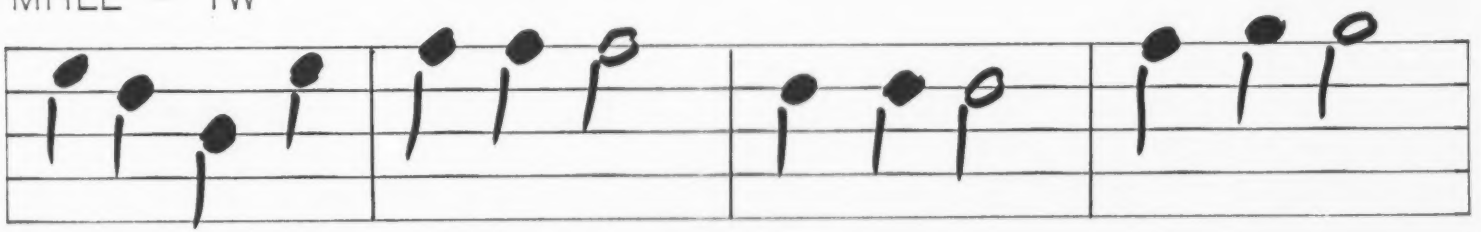
CONCLUSIONS

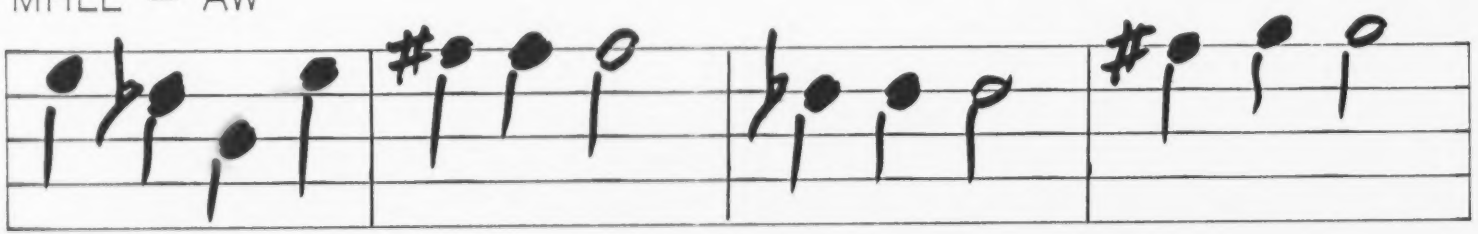
- The relative importance of features of melodies at different ages found by Andrews & Dowling is true of two of the melodies here (Fig. 4), but not the other two (Fig. 5).

- Making the stimuli more musically natural brings out the importance across all the ages of other musical variables such as tonality (Fig. 3).

- Naturalness, especially rhythmical naturalness, aids identification.

- Children make effective use of rhythmic information by 5-6 yr, and use it increasingly with age in the more difficult conditions (Fig. 6).

MHLL – ST

MHLL – TW

MHLL – AW



HWG – ST

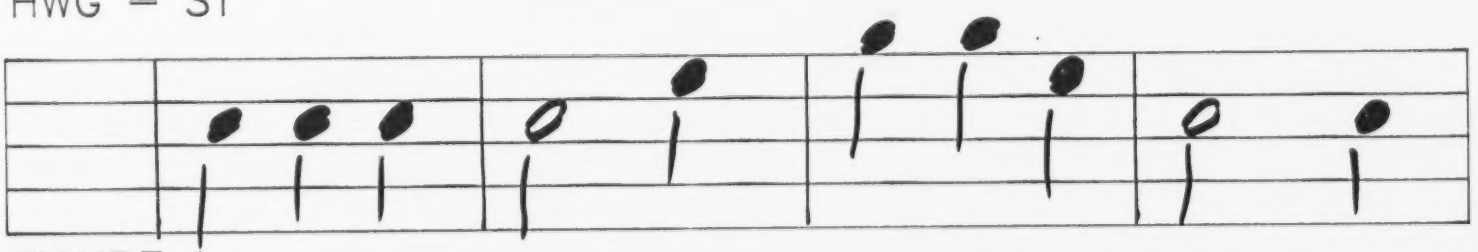


FIGURE 1

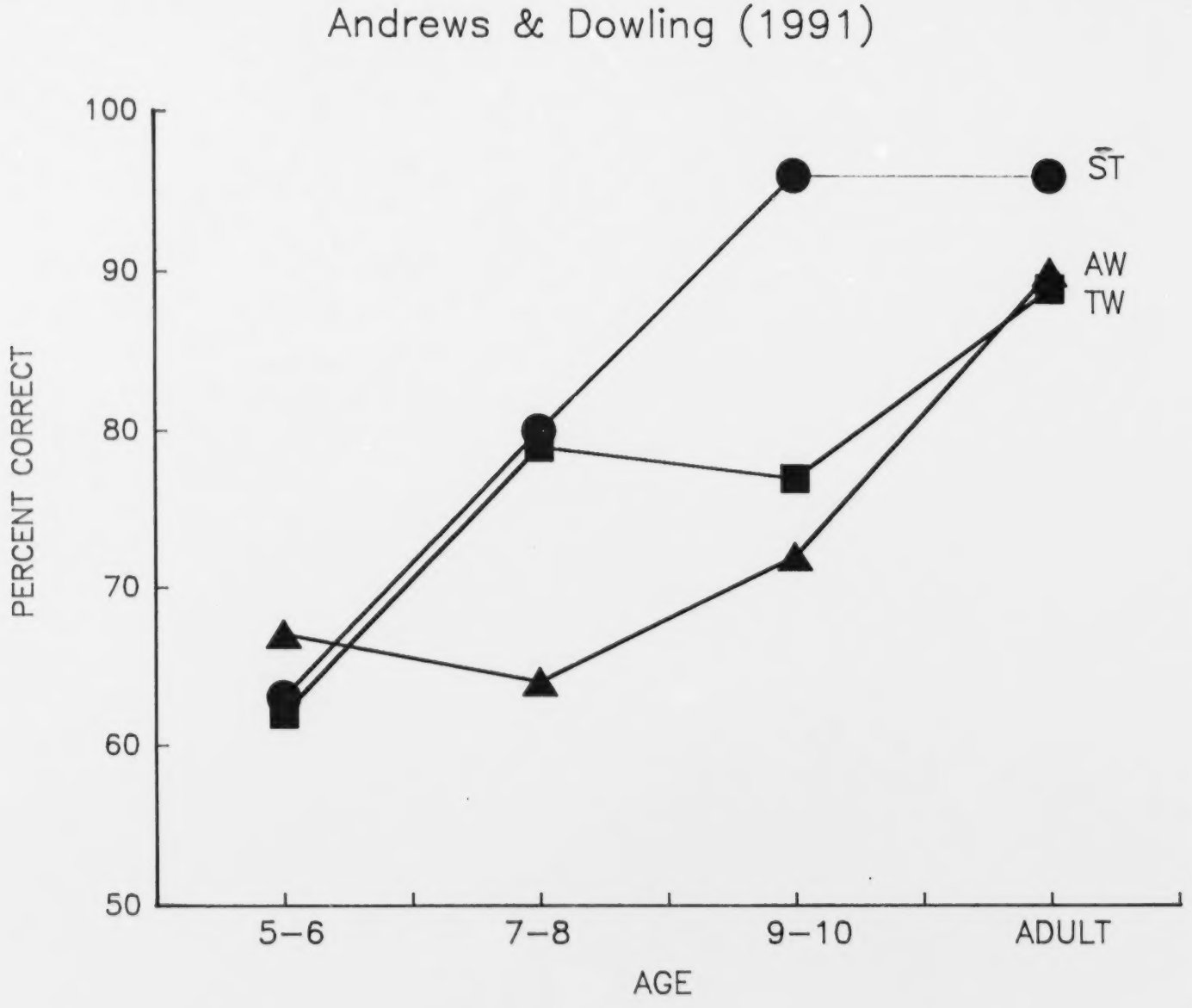

Andrews & Dowling (1991)
100
90
80
70
60
50
PERCENT CORRECT
ST
AW
TW
5–6
7–8
9–10
ADULT
AGE

FIGURE 2

OVERALL RESULTS

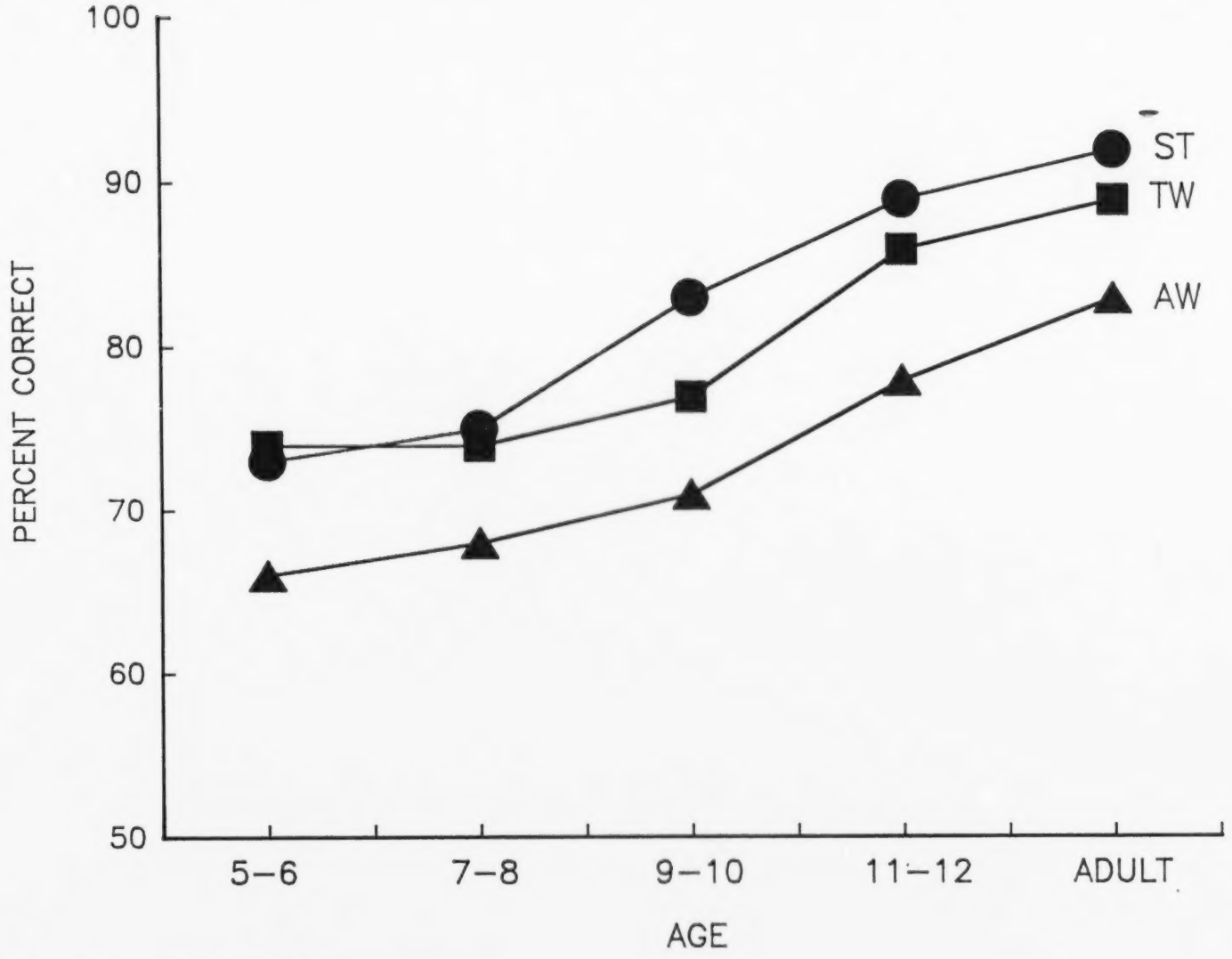


FIGURE 3

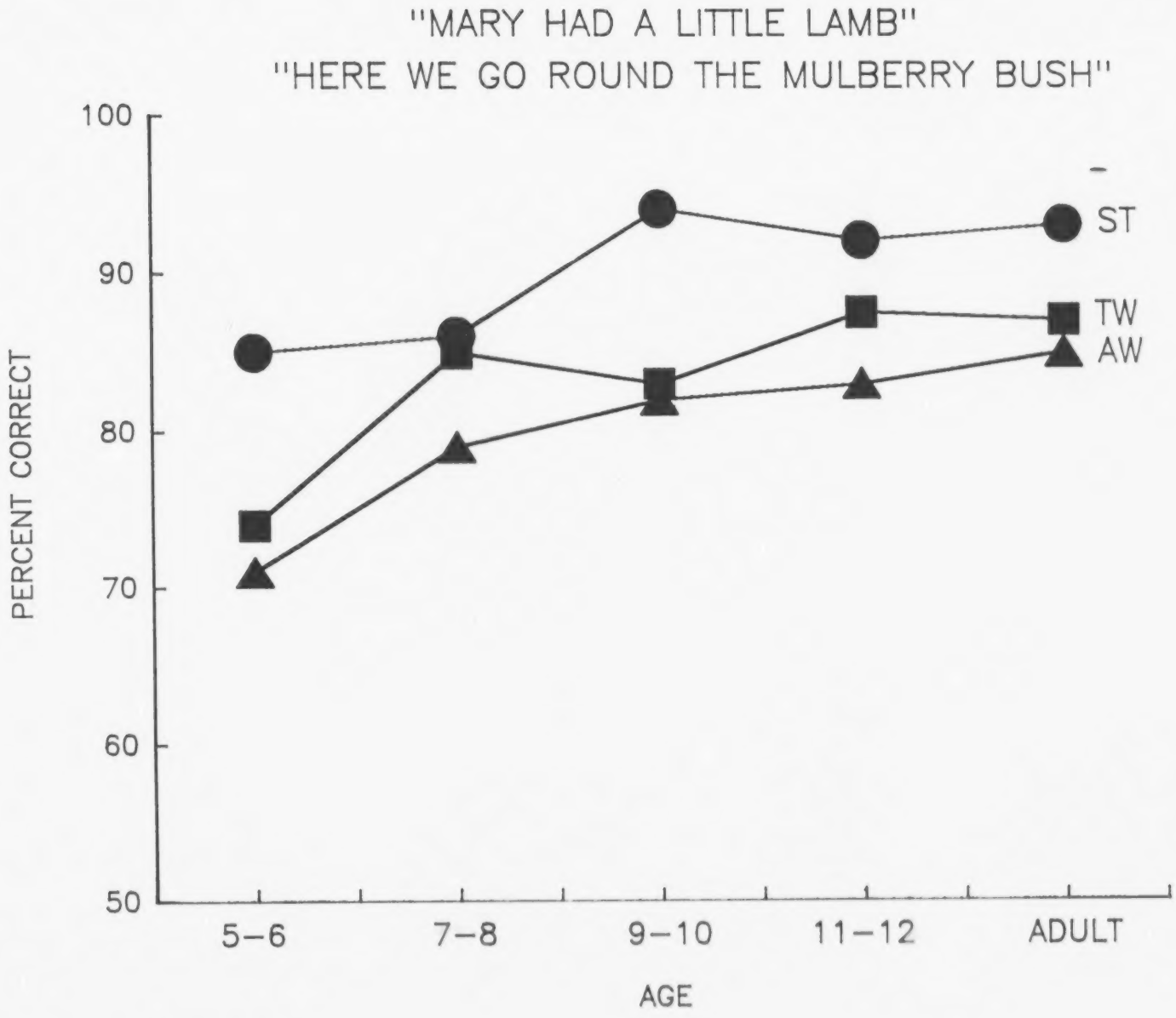

"MARY HAD A LITTLE LAMB"
"HERE WE GO ROUND THE MULBERRY BUSH"
100
90
80
70
60
50
PERCENT CORRECT
ST
TW
AW
5–6
7–8
9–10
11–12
ADULT
AGE

FIGURE 4

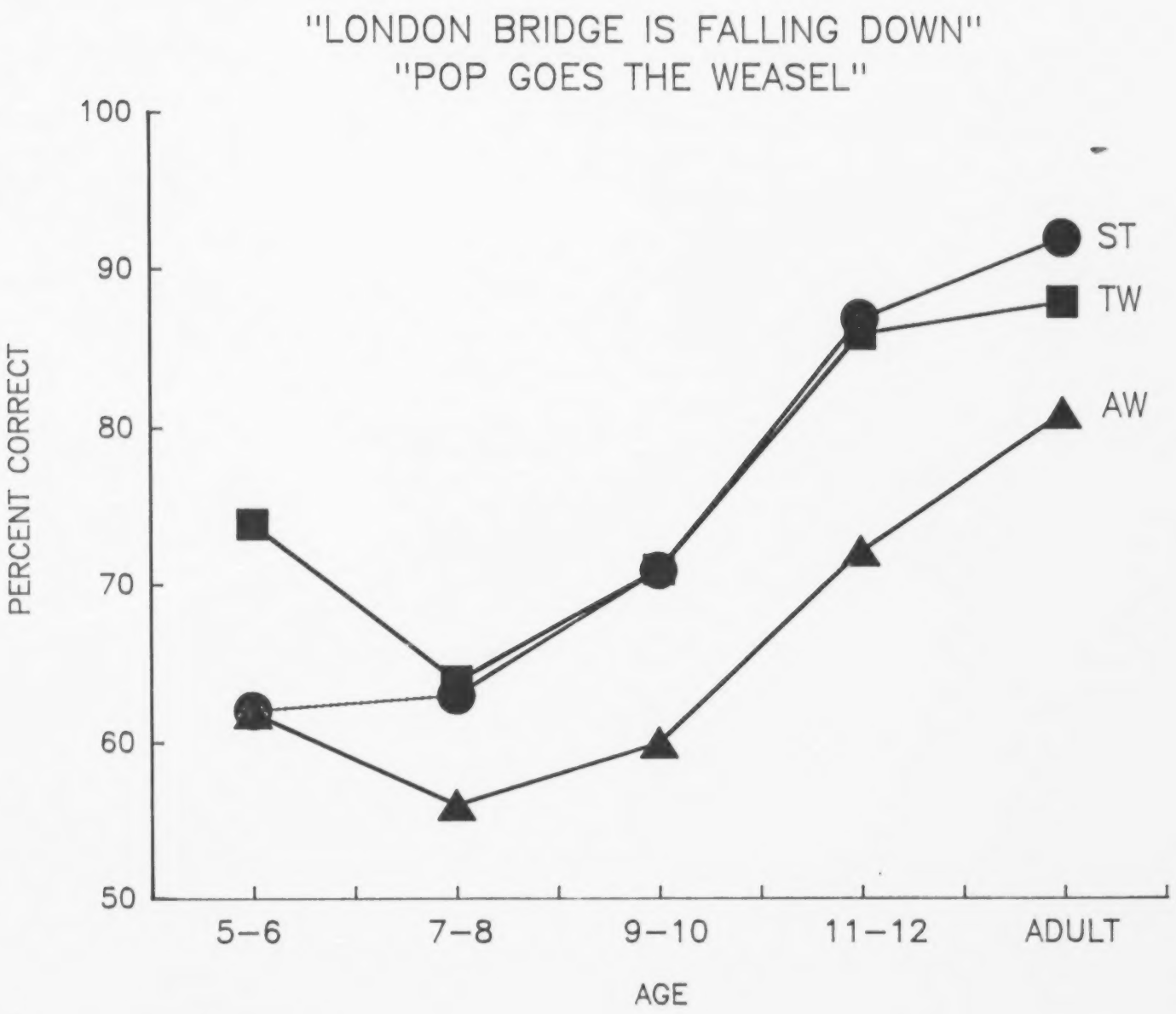

"LONDON BRIDGE IS FALLING DOWN"
"POP GOES THE WEASEL"
100
90
80
70
60
50
PERCENT CORRECT
ST
TW
AW
5–6
7–8
9–10
11–12
ADULT
AGE

FIGURE 5

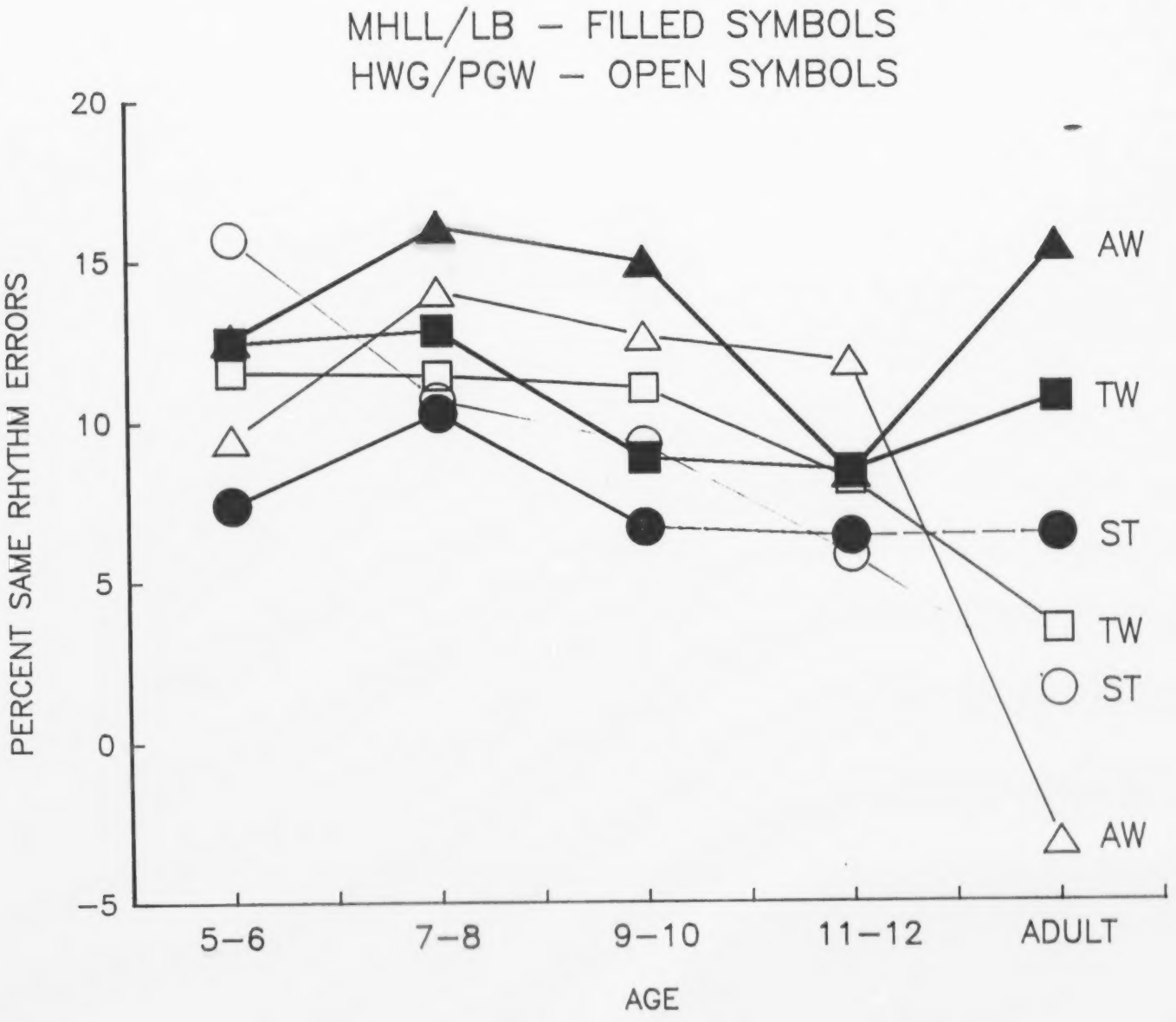

MHLL/LB – FILLED SYMBOLS
HWG/PGW – OPEN SYMBOLS
PERCENT SAME RHYTHM ERRORS
20
15
10
5
0
–5
5–6
7–8
9–10
11–12
ADULT
AGE
AW
TW
ST
TW
ST
AW

FIGURE 6